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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/568,536	02/17/2006	Kohei Suzuki	043888-0439	4534

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EXAMINER	
LEE, CYNTHIA K	

ART UNIT	PAPER NUMBER
1726	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

Office Action Summary	Application No.	Applicant(s)	
	10/568,536	SUZUKI ET AL.	
	Examiner	Art Unit	
	CYNTHIA LEE	1726	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 May 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,8-13,17 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,8-13,17 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

This Office Action is responsive to the amendment filed on 3/9/2010. Claim 3 has been canceled. Claims 1, 2, 8-13, 17, 18 are pending. Applicant's arguments have been considered but are not persuasive. Claims 1, 2, 8-13, 17, 18 are finally rejected for reasons stated herein below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 8-10, 13, 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (US 2002/0037450) in view of Delnick (US 5948464), Daroux (US 6562511), Kizu (US 2003/0165739).

Suzuki discloses a lithium ion secondary battery comprising:

a positive electrode 2 for absorbing and desorbing lithium ion [0030];

a negative electrode 3 for absorbing and desorbing lithium ion [0054];

and a non-aqueous electrolyte [0055];

a sheet separator 4 interposed between said positive electrode and the negative electrode [0055]. The sheet separator has a thickness of 10 – 40 um and being made of a polyethylene resin [0055]. MPEP states that prior art which teaches a range

overlapping or touching the claimed range anticipates if the prior art range discloses the claimed range with "sufficient specificity." See 2131.03.

Suzuki discloses a separator, but does not disclose a separator and a porous film interposed between said positive electrode and said negative electrode. Delnick teaches a separator comprising inorganic filler (6:46-60) and a binder 34 (7:5-15). The separator provides good performance in a very thin thickness regime, thereby allowing cell scalability to dimensions previously unattainable and performance surpassing that of prior separators that contain particulate reinforcements (6:20-25). Delnick teaches that separator made of silica renders separators with high strength and flexibility (3:25-35). Daroux teaches a separator for a Li-ion polymer battery comprised of a plurality of separator layers that are laminated together. The plurality of separator layers including a first layer formed of a first separator material, and a second layer formed of a second separator material, wherein the second layer is compositionally and structurally different from the first layer. See Abstract. The thickness of each separator is about 15 um to about 35 um (4:10). It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Delnick's porous film to the battery of Suzuki, as taught by Daroux, for the benefit of providing additional reinforcement to the separator of Suzuki that would render high strength and flexibility.

Regarding claim 1, Delnick teaches that the ratio of binder to solid particulate is 5/95 to 10/90 (7:27). MPEP states that prior art which teaches a range overlapping or touching the claimed range anticipates if the prior art range discloses the claimed range with "sufficient specificity." See 2131.03

Regarding claim 1, Delnick teaches a porous film having a thickness of 5 - 100 um (9:17). Delnick teaches of that the porous film is non-self supporting, ultra-thin, flexible and conformally bonded to the electrode (4:53-54). Delnick teaches in examples 1-3 that separators with different materials thicknesses yield different ionic conduction efficiencies. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the thickness of Delnick's separator for the benefit of obtaining a good ionic conductivity.

Regarding claim 8, Delnick teaches said inorganic filler comprises an inorganic oxide (6:45-60).

Regarding claim 10, Delnick teaches that said inorganic oxide includes alumina and titanium oxide (6:49).

Regarding the limitation in claim 1 "a porous film wherein said porous film is adhered to a surface of at least said negative electrode" and "a sheet separator interposed between said positive electrode and said porous film", it is noted that the combination of Suzuki, Delnick, and Daroux would dispose the separator and the porous film between the positive and negative electrode. Thus, either the porous film or the separator would be disposed at the surface of either the positive or the negative electrode.

Regarding the limitation in claim 1 "a total thickness of said sheet separator and said porous film is 15 to 30 um", Delnick teaches that a thin separator is necessary in an electrochemical cell (1:25). A separator must be dimensionally stable, and porous, with high electrolyte absorption and retention and low ionic resistance (1:40-45). To

minimize the ionic resistance of the separator, it must be made as thin as practical in consideratioin of the manufacturing process and the desired performance of the cell (1:56-57). It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the thickness of the separator and porous film of Suzuki, Delnick, and Daroux to form a thin separator and porous film as well as to obtain good electrolyte absorption and ionic conduction.

Regarding claim 1, Delnick teaches using PVC, PVDF, or EPDM as binders but does not disclose said first binder comprises a first rubber of an acrylonitrile-acrylate copolymer having a polyacrylonitrile chain, said first rubber being water-insoluble and having a decomposition temperature of 250°C or higher. Suzuki discloses a core-shell type rubber particle binder comprising an acrylonitrile-acrylate copolymer in a positive electrode [0031]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the binder as a separator binder as well since it has been held by the court that the selection of a known material based on its suitability for its intended use is prima facie obvious. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

Further, Suzuki discloses that the core-shell particles possess a balance between the stickiness and elasticity [0033]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the core-shell type rubber particle binder comprising an acrylonitrile-acrylate copolymer of Suzuki in the separator of Delnick for the benefit of binding the inorganic particles together and imparting elasticity to prevent the separator from puncturing.

Regarding the limitation "water-insoluble and having a decomposition temperature of 250°C or higher" in claim 1, it is an inherent property of polyacrylonitrile. See the instant Specification pg 16, last paragraph. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature *is necessarily present in that which is described in the reference.* In re Robertson, 49 USPQ2d 1949 (1999).

Regarding claim 1, Suzuki discloses said negative electrode comprises a negative electrode active material capable of absorbing and desorbing lithium ion and a second binder [0054], said second binder includes a second rubber particle including a styrene unit and a butadiene unit and a water-soluble polymer including a methylcellulose unit [0076].

Regarding claim 1, Suzuki discloses a content of said second binder in said negative electrode is 4.3 parts by weight per 100 parts by weight of said negative electrode active material [0076], and not 1.5 to 3 parts. Kizu teaches a binder is added in a proportion of preferably 1 wt %-15 wt %, to a negative electrode active material composition. When the amount of the binder is lower than 1 wt %, the adhesion between the negative electrode active material layer and the current collector becomes insufficient to permit easy release, as a result of which the cycle characteristic is unpreferably and inconveniently degraded. When the amount of the binder exceeds15 wt %; an excess presence of the binder in the negative electrode active material layer, which is an insulator, increases the electrode resistance and the cycle characteristic and rate characteristic are inconveniently preferably degraded [0159]. It would have

been obvious to one of ordinary skill in the art at the time the invention was made to vary the amount of binder in the negative electrode of Suzuki, as taught by Kizu, for the benefit of properly binding the negative active material. Kizu clearly teaches that the amount of binder is a result effective variable. It has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

Regarding claim 9, the inorganic filler of Delnick is alkaline on the surface because the separator comprising the inorganic filler is in direct contact with the electrolyte, and the electrolyte contains alkaline ions [0059].

Regarding claim 9, Delnick does not expressly teach that said inorganic oxide has a specific surface area. It is noted that surface area (m^2/g) is equal to m^3/(mass*length) or 1/(density*length). It is also noted that density is constant. Delnick teaches that that solid particulate size ranges from 0.01 um to 1.0 um (6:65-67). Delnick teaches that modifications can be made to the mixture to improve its dispersion and sizes suitable for the preferred printing processes (7:1-5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the particle size of the solid particulate for the benefit of obtaining a good dispersion.

Regarding claim 17, the inorganic filler of Delnick is alkaline on the surface because the separator comprising the inorganic filler is in direct contact with the electrolyte, and the electrolyte contains alkaline ions [0059].

Regarding claim 18, the core-shell type rubber particle comprising an acrylonitrile-acrylate copolymer has an acidic adhesive surface because it meets the structural limitations of Applicant's porous film.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (US 2002/0037450) in view of Delnick (US 5948464), Daroux (US 6562511), Kizu (US 2003/0165739) as applied to claim 1, as evidenced by the melting point of polyacrylonitrile, retrieved from <http://scientificpolymer.com/catalog/description.asp?QProductCode=134> on 3/27/2010.

Suzuki modified by Delnick and Kizu teaches all the limitations of claim 1 and are incorporated herein. Regarding claim 2, it is noted that polyacrylonitrile of Suzuki inherently possesses a crystalline melting point of 250 ℃ or more. Refer to the product description of polyacrylonitrile attached on 3/31/2010.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (US 2002/0037450) in view of Delnick (US 5948464), Daroux (US 6562511), Kizu (US 2003/0165739) as applied to claim 1, further in view of Ota (US 6365300).

Suzuki modified by Delnick and Kizu teaches all the limitations of claim 1 and are incorporated herein. Suzuki modified by Delnick and Kizu does not disclose wherein a

surface roughness of said porous film is less than a surface roughness of an electrode surface to which said porous film is adhered to. Ota teaches that surface roughness (Rmax) of the negative electrode affects the battery performance considerably. It is desirable that the value of Rmax be not less than 0.01 .mu.m and not more than 5 .mu.m. If less than 0.01 .mu.m, good bonding with the electrolytic layer cannot be obtained, resulting in easy separation. In addition, smooth deposition and ionization of the metallic lithium may not be performed at the time of charge and discharge. It appears that the deposition and ionization are affected by the bonding with the electrolytic layer (10:1-10). It would have been obvious to one of ordinary skill in the art at the time the invention was made to roughen the surface of the electrodes of Delnick and Kizu for the benefit of good bonding between the electrode and the separator. It is noted that the combination of Suzuki modified by Delnick and Kizu would roughen the surface of the electrodes, but not the porous film, and thus reads on Applicant's "surface roughness of said porous film is less than a surface roughness of an electrode surface to which said porous film is adhered to."

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (US 2002/0037450) in view of Delnick (US 5948464), Daroux (US 6562511), Kizu (US 2003/0165739) as applied to claim 1, further in view of Hampden-Smith (US 2002/0168570).

Suzuki modified by Delnick and Kizu teaches all the limitations of claim 1 and are incorporated herein. Suzuki modified by Delnick and Kizu does not disclose a mixture of a large particle group and a small particle group of the inorganic filler. Hampden-Smith teaches of providing a battery powder batch having a bimodal particle size distribution. That is, the powder batch can include battery particles having two distinct and different average particle sizes. A bimodal particle size distribution can enhance the packing efficiency of the powder which is important for use as a battery electrode [0168]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the inorganic fillers of Suzuki modified by Delnick and Kizu with two distinct particle sizes as taught by Hampden-Smith for the benefit of good packing ability.

Response to Arguments

Applicant's arguments with filed 5/16/2011 have been considered but are not persuasive.

Applicant asserts that Suzuki discloses a negative electrode using core-shell type particles. There is no rationale for one skilled in the art to substitute the material of the negative electrode of Suzuki in the binder of Delnick. Delnick teaches a separator having an inorganic filler and binder, thus, the skilled artisan would use the inorganic filler and binder of Delnick, not the negative electrode of Suzuki.

In response, Suzuki discloses that the core-shell particles possess a balance between the stickiness and elasticity [0033], and the motivation to use the core-shell type rubber particle binder comprising an acrylonitrile-acrylate copolymer of Suzuki in the separator of Delnick would be for the benefit of binding the inorganic particles together and imparting elasticity to prevent the separator from puncturing.

Further, it has been held that the selection of a known material based on its suitability for its intended use is prima facie obvious. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

Applicant asserts that Daroux fails to render the claimed range of thickness of the separator of claim 1 of 15 to 30 um, obvious because the Office Action states that Daroux teaches a separator thickness of about 15 to about 35 um. As such, the minimum thickness of the separator in Daroux, due to two layers, is 30 um.

In response, Delnick teaches a porous film having a thickness of 5 - 100 um (9:17). Delnick teaches of that the porous film is non-self supporting, ultra-thin, flexible and conformally bonded to the electrode (4:53-54). Delnick teaches in examples 1-3 that separators with different materials thicknesses yield different ionic conduction efficiencies. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the thickness of Delnick's separator for the benefit of obtaining a good ionic conductivity.

Further, Delnick teaches that a thin separator is necessary in an electrochemical cell (1:25). A separator must be dimensionally stable, and porous, with high electrolyte absorption and retention and low ionic resistance (1:40-45). To minimize the ionic resistance of the separator, it must be made as thin as practical in consideratioin of the manufacturing process and the desired performance of the cell (1:56-57). It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the thickness of the separator and porous film of Suzuki, Delnick, and Daroux to form a thin separator and porous film as well as to obtain good electrolyte absorption and ionic conduction.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CYNTHIA LEE whose telephone number is (571)272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-12922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Cynthia Lee/

Primary Examiner, Art Unit 1726